

SAFE HANDLING..... **FLAMMABLE LIQUIDS**



Flammable gases and liquids catch fire at under 100 F.

On 9/4/98 three subcontractor employees were injured by an explosion and fire that resulted from the improper use of acetone. At the time of the accident, the workers were cleaning the floor of a storage room in the Wilson Hall kitchen in preparation for painting. Apparently, an electrical arc from a floor buffer ignited the solvent vapor. Lack of awareness regarding the flammability of acetone was a major contributing factor to the accident.

Flammable liquids commonly used at Fermilab include acetone, ethanol (ethyl alcohol), gasoline, and isopropanol (isopropyl alcohol). Except for gasoline, they are most often utilized in small "squeeze bottles" for miscellaneous cleaning tasks. Flammable liquids are also major ingredients in commercial products such as cleaners and coatings, often in aerosol form. Fortunately, fires associated with flammable liquid usage have been relatively rare at Fermilab. This is not the case for the U.S. as a whole, where in 1996, fires and explosions resulted in 180 occupational fatalities and 4,200 lost workday cases.



Check extinguisher to see if it is rated to put out the type of fire you are confronting.

Before handling a flammable liquid, always read the Material Safety Data Sheet (MSDS). Container labels provide helpful information, but the MSDS is much more complete. It includes guidelines about handling, storage, disposal, first aid, and emergencies. If unsure, you should also consult with your supervisor and/or division/section ES&H organization.

In order for a vapor to burn, the atmospheric concentration must be between the Lower Explosive Limit (LEL) and Upper Explosive Limit (UEL). Lower or higher concentrations cannot be ignited. Most of the time we try to prevent fires by keeping concentrations below the LEL. The local concentration of a vapor depends on how much of the liquid has evaporated, the volume of the work space, and how well the vapor has "mixed" with the air. Different liquids evaporate at different rates. In addition, liquids evaporate faster as their temperature is increased. The temperature at which an ignitable liquid can evaporate fast enough to reach the LEL is referred to as the "Flash Point." A liquid is considered "flammable" if its Flash Point is less than 100 F. Below is a table of LELs, UELs, and Flash Points for flammable liquids commonly found at Fermilab.

<i>Flammable liquid</i>	<i>LEL (% volume in air)</i>	<i>UEL (% volume in air)</i>	<i>Flash Point (F)</i>
<i>Acetone</i>	2.5	13	- 4
<i>Ethanol (Ethyl alcohol)</i>	3.3	19	55
<i>Gasoline</i>	1.4	7.6	- 45
<i>Isopropanol (Isopropyl alcohol)</i>	2.0	12.7	53

Use common sense around flammable liquids. Never smoke, cut, or weld when you are near them. Don't mix a flammable with another chemical unless instructed to do so. Wear the right personal protective equipment (PPE) and use all suggested ventilation systems.

Static electricity can start fires when flammable liquids are transferred from one metal container to another. Use grounding and bonding wires to prevent arcing from static electricity.

Before you begin working with significant quantities of flammable liquids, make sure you know the location of two important safety tools: the spill control station, and the correct fire extinguisher.

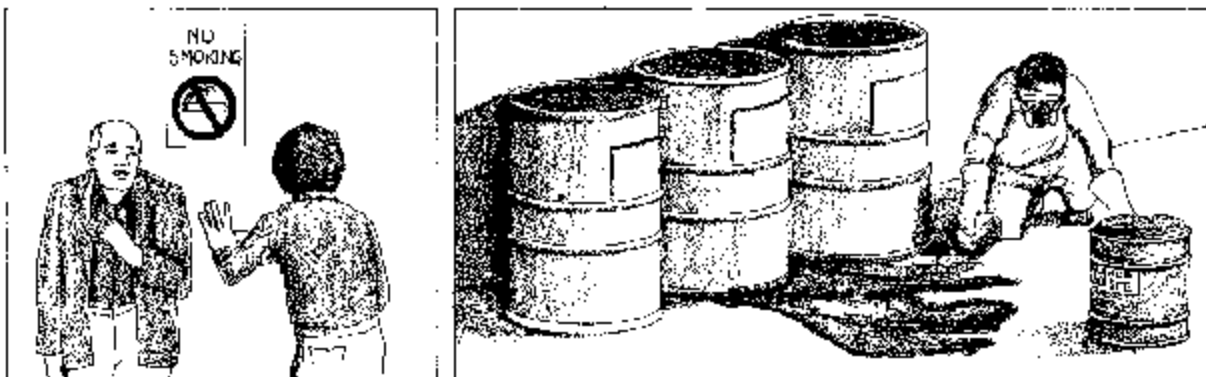
Flammable liquid containers should be stored in flammable material storage cabinets, where available. Alternatively, they should be stored by themselves, in temperature-controlled, well-ventilated areas. Keep flammable liquids far from heat or electric sources.

Store flammable liquids in approved safety containers. Small numbers of polyethylene "squeeze bottles" available from the Stockroom are acceptable in most situations. Other larger containers should have vapor-tight caps and flame arrestors. Check to see that all containers are labeled and in good working order. Labels for acetone, ethyl alcohol, isopropyl alcohol, methanol, and mineral spirits are available from the Stockroom. Fix any leaks or damaged parts, or dispose of them.

Flammable liquid wastes must be disposed of in accordance with chapter 8021 of the Fermilab ES&H Manual. Soaked rags and tissues should be collected in an acceptable container that is kept closed except when adding or removing waste to prevent evaporation. Never pour flammable liquids down the drain, sewer, garbage can, or ground. Chemical constituents must be identified on container waste labels and on the Chemical Waste Pickup Request Form.

Flammable liquids are also one of the major causes of household fires. These include gasoline, acetone, benzene, lacquer thinner, alcohol, turpentine, contact cements, paint thinner, kerosene, and charcoal lighter fluid. The most dangerous of all is gasoline. In the home flammable liquids should be stored in properly labeled, tightly closed non-glass containers; away from heaters, furnaces, water heaters, ranges, and other gas appliances; out of reach of children; and preferably outside of the house. Take extra

precautions in storing and using flammable liquids since they produce invisible explosive vapors that can ignite by a small spark at considerable distances from the flammable substance.



*Following safety guidelines and recognizing potential hazards can help **you** prevent fires at your worksite.*